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XXX.—*On the Migration of Cultivated Plants in reference to Ethnology—Sacchariferous Plants.* By JOHN CRAWFURD, Esq., F.R.S.

[*Read Dec.* 11*th*, 1866.]

I PROPOSE in this paper to give some account of the history and migration of plants cultivated for the production of sugar. The first saccharine matter used by man was honey, and since it is equally with any other, the produce of plants, and as both the plants and the bees can be and are cultivated, it may be properly included in the category I am about to render an account of.

Honey must have composed a large part of the food of the first men as it still does of all savages. Wherever there are flowers, there are bees, and consequently honey from the equator almost to the arctic and antarctic circles. In regions with a winter, the bee lays in a large store of honey, but within the tropics, and especially towards the equator, where there are flowers in bloom throughout the year, it lays in small and frequent stores of a poorer honey, and only to feed the larva. In temperate regions the bee is naturally provident, and has been often and immemorially domesticated, but in equinoxial ones it is more or less a wanderer; and I believe there is no example of of its being domesticated, unless at great elevations, as in the valleys of the Himalayas. The Greeks, the Romans, and the Egyptians very early domesticated the bee; but I believe that no great Asiatic nation ever did so. The abundance of plants in their countries yielding a ready and abundant supply of saccharine matter probably contributed to discourage the domestication of the bee among such civilised people as the Hindus and Chinese, and the extraordinary abundance of wild honey in Palestine, Syria, and Arabia, would conduce to the same result.

The general absence of other sources of saccharine matter, or ignorance of the art of extracting it from the plants that contained it, gave honey an importance among the ancient nations of the western world, which only ended with the establishment of an indirect communication with further Asia.

With a commodity of such universal production as honey, we should expect to find a special name for it in every different language, and this, no doubt, must at first have been the case, and generally is so at present. Thus our own name is, with very inconsiderable modifications, the same in all the Teutonic dialects, and the *mel* of the Latin itself taken from the Greek prevails in one form or other, in all the languages derived from the Latin. The Sanskrit has its own name for honey, *madu,* but the Hindi, of which it forms the basis, has, in this instance, its own name, which is *machan.* In the Tamil the name is *teyre* ; in Persian, *shahd* ; and in Arabic, *asal.* There are, however, a few anomalies in this matter. For honey the Irish or Gaelic has *mil,* and the Welsh or Armoricans *mel,* in both these instances coming obviously enough from the Latin. In the same manner, the Sanskrit name (*madu*) is the only one in the Malay and Javanese. In both these cases, a term of the language of a more civilised people would seem to have supplanted the native one of a rude one. This probably arose from honey being an object of trade between the rude and the civilised people, when the name for it in the language of the civilised man might in time become familiar to the barbarian, and take the place of his own native one. This, as will be seen in a future paper, has actually taken place with the clove and nutmeg commodities, of which the popular names are taken from the Sanskrit, although the plants themselves are entirely local, and could have been known to the Hindus only as objects of trade.

Among the plants yielding the most abundant and easily accessible supply of saccharine matters are the palms, and most probably they afforded one of the earliest sources of sugar, wherever palms abounded. It is only necessary to boil down the sap of any palm, previously to its undergoing fermentation, which it does rapidly, in order to obtain a concrete impure mass of sugar. This crude commodity is the sugar chiefly consumed in southern India, in the Hindu-Chinese countries, and in the Malay and Philippine Archipelagos. All palms yield a sweet sap, convertible by boiling into such sugar, but those yielding valuable fruit, such as the date, the coco and the areca, are not put to this use. In continental India, the palm chiefly applied to this purpose is the Palmyra (*Borassus flabelliformis*), the same of which the leaves are used for writing on. In the Malayan Archipelago it is the gomuti or sagwine (*Borassus goomutus*), and in the Philippines it is the Nipa (*Nipa fruticans*).

The words gomuti and nipa are both genuine Malay words, and I may here observe that many of the names, both generic and specific, adopted by botanists, some of which have been naturalised in the European languages, have been taken from the Malay, owing to the plants having been first seen and described by Europeans in Malayan countries. In the Hindi language, the name of the palm sap is *tari,* usually corrupted by Europeans into toddy, and hence the name of the English potation, which it was thought by those who imposed the name resembled it.

Although the sugar obtained from palms be equally capable of refining as that obtained from the cane, the produce of the latter is the main source of the sugar of commerce. The sugar cane is the *saccharum officinarum* of botanists, one of a genus of many species of tall grasses. Like most cultivated plants, it consists of several permanent varieties, differing in size, in the colour of the epidermis, and in the proportion of saccharine matter they contain. Like most of the cereals, the sugar-cane has not been traced to its wild state. In its cultivated state it has been found in many independent places, often remote from each other, and bearing independent names. Its geographical limits are nearly the same as those of cotton ; that is, extending from the equator to about the thirtieth degree of latitude. Like cotton, its culture has been pushed up to the fortieth degree, but even with less success, for the cane takes a year to arrive at maturity, and is, therefore, liable to be cut off by severe frosts.

In what country the sugar-cane was first cultivated, it is out of our power to discover ; but, as far as we know, it has been immemorially cultivated in the tropical and sub-tropical parts of Hindustan, in the Hindu-Chinese countries, in the tropical and sub-tropical parts of China and of Japan, in the Malay and Philippine archipelagoes, and in the tropical islands of the Pacific ocean. There is no evidence of its having been cultivated in any country west of the land of the Hindus. It was unknown as a wild plant in Australia and New Zealand, and is unquestionably an exotic in America.

In endeavouring to trace the migrations of the sugar-cane, and the history of sugar its produce, by lingual evidence, we have carefully to distinguish between the name of the plant and that of its produce ; the first varying with the languages of the country in which the plant is cultivated, while the name of the last is essentially the same in many tongues. The cause of this is obvious, namely, that the plant was, without doubt, cultivated in every country in which it was found, long before any one thought of the process of extracting sugar from it. It is so at present throughout the tropical islands of the Pacific, in all the islands of the Malay and Philippine archipelagoes, and in the Hindu-Chinese countries, and even in southern India itself ; wherever, in short, Chinese or Europeans have not introduced the art of sugar making. In all these countries the cane is a mere sweetmeat, sold in the markets, to be masticated for its juice.

When I was on a mission to the Burmese, supplies of sugar-cane were furnished to us regularly, along with honey and fruits. The same was the case in Siam, and the manufacture of sugar from the cane was only commenced in the latter country about twenty years before my visit to it in 1822, and this by the Chinese colonists ; whereas the manufacture of palm-sugar had been in existence in Burmah and Siam time out of mind or record.

With regard to the manufacture of sugar from the cane, I begin with India; by no means satisfied, however, that it originated in that country. In Sanskrit, the name for the cane is *ukh*, in Hindi *ganna*, and in Tamil *karampu*. In the Hindu-Chinese languages I find no fewer than seven distinct names for it, not necessary to enumerate. In Malay and Javanese the name is *lâbu*. It seems not improbable that, in all the countries in which these many names prevail, the cane was a native, and that it was not until the savage inhabitants had consumed the wild plant that they betook themselves to cultivate it, a process of no great difficulty, since the sugar-cane is easily progagated by mere cuttings stuck in the ground. Yet, the culture of the cane must have been subsequent to that of such necessaries of life as the yam, the batata, and the caladium; for to wait for twelve long months for the ripening of a mere luxury would tax the patience of the semi-savage.

With respect to the produce of the cane, or sugar, the Sanskrit language has two names for it, *sakara* and *gura*, both of which have had a very wide circulation, especially the first. The Sanskrit *sarkara* becomes in Tamil *sârkarai*, in Kanarese *sharkare*, in Persian *shakar*, in Arabic *sukar*, in Greek *sakkaron*, in Latin *saccharum*, in Spanish, with the Arabic article, *asucar*, in Italian *succhero*, in French *sucre*, and in English *sugar*.

The second Sanskrit name, *gura*, occurs in Hindi with the elision of the final vowel, as *gur*, and in the Malay and Javanese with the exchange of one liquid for another, as *gula;* the Javanese, however, in its recondite language, preserving also the first Sanskrit name in the forms of *sakar* and *srakara*. There can, then, be no doubt but that the names for sugar, in all the languages now referred to, came, directly or indirectly, from the Sanskrit.

But the Sanskrit origin of the word would by no means give to the Hindus the credit of being the first to discover the art of extracting sugar from the cane. It is probable that the Hindu manufacture never went beyond the production of the impure mass, consisting of sugar and molasses, obtained by boiling the sap of the cane, as is done with the sap of palms. This is, in fact, the *gur* or sugar of the Hindus; and, until instructed by strangers, they seem to have known no other. We come to this conclusion, from finding that sugar which has undergone a process of refinement bears foreign names. Thus clayed sugar goes under the name of *chini*, which signifies "Chinese"; while candied or crystallised, is called *misri*, which means Egyptian. As the first of these words is Persian and the last Arabic, we infer that the sugar of the Hindus was confined to the crude inspissated sap of the cane or of palms, and that processes of refining were introduced after the Mohammedan conquest of India, one process from China, and the other from Egypt. The process of "clarifying" would probably be introduced by Mohammedan merchants trading with China. As the cane was unknown to the Greeks and Romans as an object of culture, it must have been first introduced into Egypt by the Arabs; and here, probably, it was that the art of crystallising the sap was first discovered by the nations of the west, and hence the name.

The processes of refining sugar were certainly of foreign introduction in India; and this we can readily believe, from the state of the arts among the Hindus, when we find the emperor Baber, in his *Memoirs*, complaining that they were ignorant of soap and candles in the beginning of the sixteenth century. The sugar of the Hindus, such as it was, was at first made from the sap of palms; and that of the cane, obtained by a more complex process, would not be had recourse to except where palms were scarce, and in rich lands in which alone the cane will flourish.

As to China, the cultivation of the cane, and the manufacture both of clayed and crystallised sugar from it, are of an antiquity beyond all record; and for this I have the highest authority, that of my friend Sir John Davis. In the Mandarine, or most ancient dialect of the Chinese, the name for the sugar-cane is "the sweet cane", and for sugar itself *tâng.*

The Hindus who settled in the Malayan islands, but more especially in the best of them, also the nearest to their own country, Sumatra and Java, may have taught the natives the art of making sugar from the cane; but here also the Sanskrit word equally applies to palm as to cane sugar; and the manufacture of true sugar was probably first introduced into these islands by the Chinese in very modern times. The Malayan names for clayed and candied sugar, are but the Sanskrit word with native epithets signifying "sand sugar" and "stone sugar"; the first of these being a literal translation of the Chinese name.

If the ancient Hindus were unacquainted with the art of refining sugar, and that their sugar was nothing else than the crude mass obtained from the sap of the cane or palm by mere boiling (the jaggery of Europeans, a word which Horace Wilson tells us is but a corruption in the Canarese language of the Sanskrit word *sarkara*), then India is not likely to have been the country which furnished the Greeks and Romans with the small quantities of sugar which reached them. The crude Hindu commodity is still an article of trade from one province of India itself to another, and might with its Indian name have perhaps even reached the neighbouring country of Persia; but it would certainly not have borne the expense of the distant carriage to Europe. Nor does it, indeed, answer in any respect to the description given of the *sakkaron* of the Greeks, or the *saccharum* of the Romans. Pliny's account is the following: "Arabia produces *saccharon*, but that of India is preferable. It is a kind of honey which gathers on canes —white like gum, brittle under the teeth, of the size of a filbert, and is used only in medicine."

It is evident enough that Pliny had but a very vague notion of the origin of sugar. He ascribes the plant producing it, not only to India but to Arabia, where, in his time, it was as unknown as it was in Italy. Yet Pliny lived four centuries after Alexander's invasion of India, and many Greeks must have seen and described the sugar-cane and its produce if it existed in that time in Upper India, the quarter of the country chiefly frequented by them. The account, however, which Pliny gives of saccharon shows that he had himself seen and examined it. He describes it as white, like gum, brittle under the teeth, and of the size of a filbert, characters which very fairly represent a crystal of Chinese sugar-candy. If, then, as I suppose, the Hindus were in the days of Pliny ignorant of the art of crystallising sugar, it follows that the saccharon of the ancients was the produce of China: the Chinese, let it be added, always manufacturing their sugar-candy in distinct white crystals, an art unknown to the Hindus, and, indeed, even to modern Europeans.

If the saccharon was the production of China, it may be asked how it found its way to Rome; and the answer is obvious, by the same route, including a passage through Persia, by which the silk of the same country reached the Roman markets. Its use among the ancients was confined to medicine, sufficient evidence of scarcity and ignorance, and a strange contrast to its present use, when it has become nearly a necessary of life over all Europe.

But the channel through which sugar became known to the Greeks and Romans was not that by which it came to the knowledge of the modern nations of Europe, that which brought Europe and Asia into a more immediate and intimate relation than were possible in ancient times. The Greeks and Romans knew nothing of sugar, but as an article of trade, just as they knew silk and pepper. They were uncertain about the country which produced it, and ignorant of the plant which yielded it. The Arabs, on the contrary, brought the plant itself from India, with the Indian name of its produce, cultivated it in Syria, in Egypt, in Greece, in North Africa, in Spain, in Sicily, and in Southern Italy, manufacturing sugar from it in all these places. At what time the Arabs introduced the culture of the cane and the manufacture of sugar into Syria and Egypt is unknown, but it is ascertained that sugar was imported from the countries now enumerated into Venice at the end of the tenth century (991). The Crusaders found the cane cultivated in Syria as early as the beginning of the twelfth century (1108), and sugar made from it, seemingly by very rude processes, so that the article would seem to be little better than the crude unrefined mass called by the Hindus gur and juggary. In the year 1420, or seventy-two years before the discovery of America, the Portuguese carried the sugar-cane to Madeira. In the fifteenth century the Spaniards carried the cane and manufacture of sugar to the Canary Islands, from whence they were conveyed to tropical America and its islands. In 1503, or but eleven years after its discovery, the culture and manufacture were fully established in Hispaniola.

Sugar was, however, an article of consumption in Western Europe long before the discovery of America, the countries furnishing it being, as already stated, Spain, Sicily, Barbary, Madeira, and the Canaries. When the production was extended to Brazil, the supply became enlarged. England was supplied from the emporia of Venice and Antwerp, and in the time of Shakespeare the name of the article was so familiar as already to have its secondary or figurative meaning, as in the expression, "sugared words," and in the well-known passage of Hamlet,—

> "'Tis too much proved that with devotion's visage
> And pious action, we do sugar o'er
> The devil himself."

For economic purposes there are other plants which yield sugar, but not so profitably as palms and the sugar-cane. The beet is largely cultivated with this view, especially in France, but the manufacture exists only under the protection of fiscal laws. In North America a species of maple (*Acer saccharinum*) yields a considerabe supply of sugar by tapping its trunk for the sap, which is boiled and refined in the same manner as the sugar of the cane. The sap continues to flow for from a month to six weeks, and an ordinary tree will, during the season, yield from twenty to thirty gallons, convertible into from five to six pounds of sugar, so that the maple is by no means so productive as the Palmyra palm. Such sugar-yielding plants are merely local, and hardly come under the class of plants of which I have now endeavoured to give an account.

It seems strange to us that the ingenious Greeks and luxurious Romans should have contented themselves with honey, and never have fallen into the art of manufacturing a solid sugar from indigenous plants yielding a sweet sap. They were well acquainted with the beet and the carrot, and, of course, with the grape, all of which would by an easy process have yielded a solid sugar. As savages they had invented the more difficult art of kindling a fire, and as barbarians the yet more difficult arts of making malleable iron and reducing the ores of copper and silver, but the art of extracting sugar from their own plants never occurred to them.